

Enhanced Surveillance Sub-Group Particulate Matter Working Group

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Chair, ESSG-PMWG

Agenda

- Background on Particulate Matter Work Group and sub-groups
- Update status of Enhanced Surveillance project
- Complete analytical lists
- Microbial Risk

Background

- Operation Sandman
 - Naval Dental research program to identify desert dust impact on biomedical equipment
 - Study identifies presence of fine particulate with what might be unique chemical properties, heavy metals, and microorganisms including potential pathogens
 - Initial review of study identifies issues

Response

- Navy SG takes study findings to JCS
- Dr. Winkenwerder charts Particulate Matter Working Group to study findings of Sandman
 - Representation by OSD-HA (Chair, Dr. Kilpatrick), Army, Navy, Air Force SGs, DIA, MRMC
 - Three sub-groups
- Charter signed 26 April

Sub-Groups

- Medical Effects
 - Dr. Weese (USACHPPM)/Dr. Knechtges
- Enhanced Surveillance
 - Dr. Heller
- Potential Weaponization
 - Ms. Teresa Vallecorsa (DIA)

Current Sub-Group Composition

- Dr. Jack Heller, DHRM, USACHPPM, Chair
- James Sheehy, DESP, USACHPPM
- Jeffrey Kirkpatrick, GTAP, USACHPPM
- COL (Dr.) Chris King, Department of Geology and Environmental Engineering, USMA
- Al Kelly, Natural Environments Test Office, Developmental Test Command, Army Test and Evaluation Command
- Dr. Dale Gillette, NOAA/USEPA
- Kurt Jagielski, AFIOH
- Maj David Torres, AFIOH
- LCDR Ray Stiff, NEPMU-2/NEHC
- CDR (Dr.) Dave McMillan, HQ USMC
- MAJ Bill Darby, USCENTCOM SG
- MAJ Michelle Bell, AFMIC, USCENTCOM Desk Officer

Current Status

- Army MEDCOM funded (GWOT)
- Sampling protocol being finalized (comments received)
- Equipment orders
 - Airmetrics MiniVol (42 each, contract let, awaiting delivery)
 - TSI DustTrak (16 each, on site)
- Working with CCSG to prepare FRAGO for sampling

Current Status, continued

- Enhanced Surveillance intent to better define characteristics of suspended particulate in USCENTCOM AOR
- Contract through Yuma Proving Ground to amend Desert Research Institute contract for desert dust characterization
- Microbial/Bio-aerosol piece under development

Protocol Approach

- Co-located Total Suspended Particulate (~50 micron), PM₁₀, and PM_{2.5} collected during same 24 hour period
- Sample every six days.
- Different filter/analytical suite every six days (Quartz filter, Teflon filter, Nuclepore filter, Quartz filter, and Teflon filter every 30 days)

Details of Quartz Fiber Filter Analysis

Analysis	Method
OC and EC (8 carbon species in total)	TOR
Water soluble species such as Na ⁺ , K ⁺ , Ca ²⁺ , Mg ²⁺	AA
Ammonium	AC
Sulfate, nitrate, chloride and phosphate	IC

TOR = Thermal Optical Reflectance

AA = Atomic Absorption

AC = Automated Colorimetry

IC = Ion Chromatography

Details of Teflon Filter Analysis

Analysis	Method
Metals: antimony, arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, vanadium, zinc, mercury and strontium	ICP-MS
Elements: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Br, Rb, Sr, Y, Zr, Mo, Pd, Ag, Cd, In, Sn, Sb, Ba, La, Au, Hg, Tl, Pb, U	XRF
Mineralogical data to complement chemistry on selected re-suspended sample sets	Quantitative XRD

- ICP-MS = Inductively Coupled Plasma Mass Spectrometry
- XRF = X-ray Fluorescence Spectrometry
- XRD = X-ray Diffraction

Details of Nuclepore Filter Analysis

Analysis	Method
Aerosols are semi-quantitatively grouped as "mineral types" into bins by size and chemistry (NOTE: aerodynamic mass distribution for 0.01-1, 1-2.5, 2.5-4, 4-7.5; and 7.5-10 μm ; 10-30 μm ; > 30 μm in RJ Lee Report)	CCSEM by RJ Lee
Morphology, i.e. the particle size and shape, for example how fractured or well rounded the quartz grains are).	SEM

- CCSEM = Computer Controlled Scanning Electron Microscopy
- SEM = Scanning Electron Microscopy
- DustTrak used to determine length of time to operate samplers to get optimum filter cake density

Enhanced Surveillance

- Sampling Locations:
 - 5-6 Iraq (Army/Navy), 2 Kuwait (Navy), 2 Afghanistan (Army), 1 Qatar (AF), 1 UAE (AF)
- Analysis
 - DRI and subs (RJ Lee for microscopy, RTI for some chemistry to ensure timelines are met)
 - DRI for comparison of study data with results from other deserts

Surveillance Challenges

- Unit buy-in
- Getting equipment on site
- Redundant equipment
 - 2 spare DustTrak's
 - 14 spare MiniVols (per USN), also on order

Microbial Characterization

Intent: Determine if microbial pathogens are aerosolized from soil and if they can negatively impact servicemember health

Stepwise process will be used

Stepwise Process

Soil samples cultured
(Soil is considered the source for bioaerosols)



Pathogenic species that are considered inhalation hazards (including opportunistic pathogens) will become the targeted organisms for the air sampling

Air sampling

Estimation of exposure



Characterize risk
(potential for infection/illness caused by/associated with exposure)

Microbial Challenges

- Lack of knowledge regarding background
- Transport of samples
- Cultureability of environmental microorganisms
- Quantification of microorganisms
- Infectivity assessment (how much is too much?)

Task List/Suspenses

- Review OPN Sandman Report, Research Proposal, and DRI Soils Characterization – complete
- Prepare OIF/OEF Enhanced Surveillance analytical list and sampling protocol/schedule – complete
- Staff Protocol with Workgroup - complete
- Finalize comments received - Complete
- Send completed FRAGO template to CCSG – 9 Sept
- Sampling Equipment to field – 30 Sept, depending on delivery and shipping (originally 31 Jul)
- Initiate Sampling – NLT 15 Oct (originally 31 Aug)
- Site Visit to DRI – 9 Sept
- Microbial assessment - TBD